Amendment to the Claims

1. (Currently amended) An electric machine (10; 10') with a rotor (26a. 26b; 26c; 36) which is rotatably mounted in a housing (12) with a rotor shaft (24) which extends beyond the housing, a plurality of electromagnet components (28) which are statically disposed in the housing at uniform angular spacings and spaced from the axis of rotation of the rotor, each with a coil core (32) bearing a coil winding (30) consisting of one or more conductors and with permanent magnets (27) which are disposed at uniform angular spacings and are non-rotatably retained in or on the rotor, these permanent magnets each having a pole face aligned opposite end faces of the coil cores (32) and each having a polarity which is successively reversed in the peripheral direction, wherein the coil cores (32) of the electromagnet components (28) are disposed parallel to the axis of rotation of the rotor shaft (24) in the interior of the housing in such a way that their opposing end faces each lie in two planes which are spaced from one another and extend at right angles to the axis of rotation of the rotor shaft and the ends of the electric conductors which form the coil winding (30) of the individual electromagnet components (28) are interconnected via an electric or electronic control device to form at least two pairs of electrical connections and the rotor has at least two outer armature discs (26a, 26b; 26c) which extend radially to before the end faces of the coil cores and in which the permanent magnets are retained with their pole faces aligned with the respective associated end faces of the coil cores, the radially inner region of the said armature discs being provided with ~~holes~~ openings (46), wherein in each case pairs of legs, which succeed one another in the peripheral direction, have a free end and are each provided with a pole face of different polarity on

the free end facing the coil, of the permanent magnets (27) provided in the two opposing outer armature discs (26a, 26b) are connected to one another in end regions remote from the pole faces by a respective yoke (27a) which encloses the magnetic field and is made from soft or hard magnetic material, ~~that~~ wherein the armature discs (26a, 26b) are connected to one another by radially extending walls (38; 38') which form the cavity between the armature discs unto a plurality of chambers (40) which are offset with respect to one another in the peripheral direction and are open towards the electromagnet components (28), and ~~that~~ wherein the radially inner ~~holes~~ openings (46) provided in the armature discs (26a, 26b) each open into the chambers (40) of the rotor; ~~and~~

wherein the housing includes end walls (14a, 14b) and a peripheral wall (16) defining ~~defines~~ an interior which is closed off and sealed against the external atmosphere; and

wherein ~~the housing and the rotor define a flow path within the interior and extending through the coil windings~~ , when the rotor is rotating, a fluid contained within the interior of the housing is forced to flow from first spaces defined between the armature discs (26a, 26b, 26c) and the respective housing end walls (14a, 14b) through the openings (46) and into the chambers (40), and then radially outwardly over the outside and between the electromagnet components (28) and into second spaces defined between outer peripheral boundary faces of the armature discs (26a, 26b) and the peripheral wall (16), and then radially inwardly through the first spaces and back into the openings (46), thereby providing for forced circulatory flow of the fluid in a closed flow path defined by the housing and the rotor and extending through the coil windings.

2. (Previously presented) The machine as claimed in Claim 1, wherein a row of electromagnet components (28) is provided in the interior of the housing of the machine, and that the rotor has two outer armature discs (26a, 26b) guided on opposing sides in front of the coil core end faces of the electromagnet components (28).

3. (Previously presented) The machine as claimed in Claim 1, wherein two or more rows of electromagnet components (28) spaced from one another in the longitudinal direction of the rotor shaft are disposed in the interior of the housing, and that in addition to the two outer armature discs (26a, 26b) which are guided in front of the outer end faces of the coil cores (32), pointing in opposite directions, of the outermost rows the rotor has an additional armature disc (26c) with permanent magnets (27) guided into each space between adjacent rows of electromagnet components (28) in front of the end surfaces thereof which face one another, and the pole faces of differing polarity of the permanent magnets (27) which are each exposed on opposing sides of the respective additional armature disc are aligned in the radial direction with the end faces of the coil cores (32) of the rows of electromagnet components.

4. (Cancelled)

5. (Currently amended) The machine as claimed in ~~Claim 4,~~ claim 1, wherein the outer and/or inner face of the housing (12) is provided with ribs in order enlarge the surface of the housing which gives off or takes up heat.

6. (Currently amended) The machine as claimed in Claim 5, wherein radially extending ribs are integrally provided on the inner faces of the housing end walls (14a;

14b) facing the rotor and between these ribs radial channels are formed for the return of the ~~gaseous atmosphere~~ fluid circulated in the interior of the housing.

7. (Currently amended) The machine as claimed in Claim 6, wherein the radial channels are closed off on the armature disc side by a ~~metal~~ plate so that, between the radial walls (38; 38'), the channels open only on a radially inner end and a radially outer end and are connected to the interior of the housing and through which the circulated air is returned.

8. (Cancelled)

9. (Previously presented) The machine as claimed in claim 1, wherein the electromagnet components (28) are disposed at uniform spacings in the peripheral direction and protrude from the inner face of the peripheral housing wall (16) into the space formed between the armature discs (26a, 26b).

10. (Previously presented) The electric machine as claimed in claim 1, wherein each pole face of the permanent magnets (27) has in the peripheral direction an extent which covers at least two pole faces of the coils (30, 32) of two electromagnet components (28) which succeed one another in the peripheral direction, and that the control means is designed so that in order to drive the rotor this control means switches over the polarity of every second one of the electromagnet components which succeed one another in the peripheral direction with each rotation of the rotor about an angular spacing which corresponds to the angular spacing between two electromagnet components (28) which succeed one another in the peripheral direction.

11. (Cancelled)

12. (Previously presented) The electric machine as claimed in claim 1, wherein more than three pole faces of the coils of electromagnet components which succeed one another in the peripheral direction can be associated with each pole face of the permanent magnets, in which the case the control means is designed so that in order to drive the rotor, after the rotor has rotated by an angular spacing corresponding to the angular spacing between electromagnet components which succeed one another in the peripheral direction, the control means successively switches over the polarity of every one of the electromagnet components, which succeed one another in the peripheral direction, of the group of electromagnet components associated with a permanent magnet.

13. (Previously presented) The machine as claimed in claim 10, wherein a position pick-up which senses the relative rotational position of the rotor in the housing (12) is associated with the control device for initiating the switching over of the polarity of the electromagnet components (28)

14. (Previously presented) The machine as claimed in Claim 13, wherein the position pick-up is constructed as a contactless sensor, particularly an optical sensor, which senses the relative rotational position of the rotor with respect to the housing.

15. (Previously presented) The machine as claimed in claim 1, wherein the electromagnet components (28) are each held on separate support elements which can each be installed in an associated opening the in the peripheral wall (16) of the housing (12) in such a way that the pole faces of the coils of the electromagnet components (28) are in the prescribed assembly position in alignment with the pole faces of the permanent magnets (27) between the armature discs.

16. (Currently amended) The machine as claimed in ~~claim 4,~~ claim 1, wherein electromagnet components (28) as a whole are pre-installed in an annular mounting, which in turn is held in the interior of the housing.

17. (Previously presented) The machine as claimed in claim 1, wherein the electromagnet components (28) each have two separate coils with opposed directions of winding (reversed-polarity differential windings 30a, 30b respectively), and that an electric or electronic control device (EC) is provided for the selective electric control of each of the coil windings (30a; 30b).

18. (Previously presented) The machine as claimed in claim 1, which operates as a generator, wherein the ends of the electrical conductors of each electromagnet component (28) which form the coil winding (30) are connected to the input connections of a separate rectifying circuit, and that the rectifying circuits are connected on the output side to a pair of electric bus lines.

19. (Previously presented) The machine as claimed in Claim 18, wherein an electronic inverter circuit is connected downstream of the generator in order to convert the generated direct current into an alternating or three-phase current which is synchronized with the power supply.

REMARKS

Claims 1, 5-7 and 16 have been amended. Claims 1-3, 5-7, 9-10 and 12-19 are presently pending.

As to the claim objections, claims 5 and 16 have been amended to depend from claim 1. Accordingly, the claim objections should be withdrawn.

In view of such amendments and the following remarks, reconsideration and allowance of the claims, as presently presented, are respectfully requested.

EXAMINER'S ACTION

The 35 U.S.C. § 103 Rejections

Claims 1-3, 9, 15 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,982,058 ("Bustamante et al.") in view of U.S. Patent No. 5,892,307 ("Pavlovich et al.") and further in view of U.S. Patent No. 5,789,833 ("Kinoshita et al."). In addition, claims 10 and 12-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bustamante et al., in view of Pavlovich et al. and Kinoshita et al. as applied to claim 1, and further in view of U.S. Patent No. 5,757,100 ("Burgbacher"). Further, claims 18-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bustamante et al., in view of Pavlovich et al. and Kinoshita et al. as applied to claim 1, and further in view of U.S. Patent No. 5,977,684 ("Lin"). Claim 1, and claims 2-3, 5-7, 9-10 and 12-19 which depend directly or indirectly from claim 1, clearly are patentable over the combinations of the references cited by the Examiner.

Claim 1, as amended, is directed to an electric machine including, in relevant part, a rotor rotatably mounted in a housing and having spaced apart armature discs

carrying permanent magnets. In addition, claim 1 requires that radially extending walls connect the armature discs (26a, 26b) to one another to form a plurality of chambers (40) between the discs that open toward electromagnet components (28), and that the discs extend radially to before the end faces of coil cores within the electromagnet components. Claim 1 further recites that radially inner regions of the armature discs define openings (46) that open into the chambers (40). Claim 1 also recites that the housing includes end walls and a peripheral wall which define a closed off and sealed interior. Claim 1 further requires that, "when the rotor is rotating, a fluid contained within the interior of the housing is forced to flow from first spaces defined between the armature discs (26a, 26b, 26c) and the respective housing end walls (14a, 14b) through the openings (46) and into the chambers (40), and then radially outwardly over the outside and between the electromagnet components (28) and into second spaces defined between outer peripheral boundary faces of the armature discs (26a, 26b) and the peripheral wall (16), and then radially inwardly through the first spaces and back into the openings (46)." Consequently, the rotating rotor in the claimed machine acts as a radial blower which provides "for forced circulatory flow of the fluid in a closed flow path defined by the housing and the rotor and extending through the coil windings." This flow of fluid, such as air, through the closed flow path cools the electromagnet components and the permanent magnets by transferring heat generated in such elements to outside of the housing via heat transfer to the peripheral and end walls of the housing, thereby creating a completely closed positive cooling system. (See spec. at p. 12, lines 6-29).

The Examiner admitted that an electric machine including a housing defining an interior closed off and sealed against the external atmosphere is not taught or

suggested by Bustamante et al. Although the unsealed machine of Pavlovich et al. includes a rotor with armature discs defining holes and chambers, the Examiner further admitted that the combination of Bustamante et al. and Pavlovich et al. does not teach or suggest a housing and rotor combination which defines the claimed closed flow path in the interior of the housing, and which provides that rotation of the rotor forces circulatory flow of a fluid contained within the interior in the closed flow path as claimed.

Although Kinoshita et al. shows an encapsulated electric motor, the rotors in the Kinhoshita et al. motor are substantially solid cores which are not in the form of spaced apart armature discs that carry permanent magnets as required by claim 1. The construction of the rotors of Kinoshita et al. provides for forced flow of gas in different paths (See, e.g., Figs. 2 and 8) than the closed path required by claim 1. Thus, the Kinoshita et al. rotor, when rotating, cannot force circulatory flow of a fluid in a closed flow path in the sealed interior of a housing, as required by claim 1, such that the fluid flows radially outwardly over the outside and between the electromagnet components which are positioned between the spaced apart armature discs carrying the permanent magnets. As the flow paths of Kinoshita et al. do not include the electromagnet components and the permanent magnets as required by the claimed closed flow path, the Kinoshita et al. rotor provides reduced cooling relative to that provided by rotation of the rotor in the claimed machine.

Thus, Kinoshita et al. does not cure the deficiencies of Bustamante et al. and Pavlovich et al. as to the lack of a teaching or suggestion of forcing circulatory flow of a fluid in a closed flow path in the sealed interior of the housing for an electric machine as required by claim 1. Kinoshita et al. teaches different closed flow paths than the

claimed invention and, furthermore, does not teach how to seal the open machine of Pavlovich et al. and arrange and construct the components contained within the housing of Pavlovich et al., alone or in view of the teachings of Bustamante et al., to obtain the closed flow path of the claimed invention.

It is, therefore, respectfully submitted that one skilled in the art would not have been motivated to modify the electric machine of Bustamante et al., in view of the holes and chambers between armature discs in the open machine of Pavlovich et al., and further in view of the closed motor of Kinoshita et al. having a substantially solid core rotor without spaced apart armature discs, to create a combination where the rotating rotor provides for forced cooling circulatory fluid flow in a closed flow path involving the electromagnet components and permanent magnets, as required by claim 1.

Accordingly, claim 1 is patentable over the cited references.

Claims 2-3, 5-7, 9-10 and 12-19, which depend directly from claim 1, are also patentable over the cited references for the reasons set forth above and because of the further restrictions they add.

Withdrawal of the Section 103 rejections is, therefore, respectfully requested.

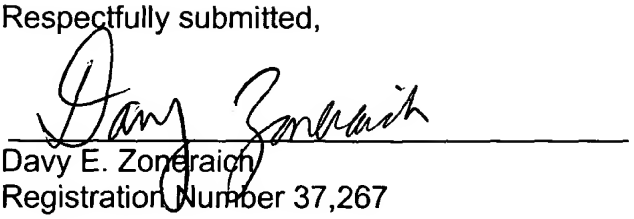
CONCLUSION

For the foregoing reasons, it is believed that all of the claims, as presently presented, are patentable.

The Examiner is invited to telephone the undersigned if it is believed that further amendment and/or discussion would help to advance the prosecution of the present application.

Reconsideration and allowance of claims 1-3, 5-7, 9-10 and 12-19 are, therefore, respectfully requested.

Respectfully submitted,



Davy E. Zoneraich
Registration Number 37,267

NORRIS, McLAUGHLIN & MARCUS
P.O. Box 1018
Somerville, New Jersey 08876-1018
Phone: (908) 722-0700
Fax: (908) 722-0755
E-Mail: ipdept@nmmlaw.com

Attorney Docket No: 101194-033US